AVIATION WEEK & SPACE TECHNOLOGY
30 AUG 1971

Recon Satellite Assumes Dual Role

Launch of spacecraft with both search-and-find and close-look functions marks U.S. move to a new generation of technology

By Philip J. Klass

Washington—U.S. has begun the transition to a new generation of reconnaissance satellites, designed to perform both the search-and-find and close-look functions that previously required the use of two separate spacecraft.

The first of the new-generation satellites, built by Lockheed Missile & Space Co., was launched on June 15 into a near-polar, low-altitude orbit from the Western Test Range (AW&ST June 21, p. 15). The new design is understood to have performed well.

The satellite, unofficially referred to as "Big Bird," weighs approximately 25,000 lb., which is four to five times the weight of present operational designs. The spacecraft, a modified Lockheed Agena measuring approximately 10 ft. in diameter and nearly 50 ft. long, was launched by a USAF/Martin Marietta Titan 3D. It was the first time this large booster with its two large strap-on solid rockets has been used.

Big Bird carries a huge new camera, developed by Perkin-Elmer Corp., which is expected to provide ground resolutions of better than 1 ft. from an orbital altitude just over 100 mi.

Since the U.S. initiated its reconnaissance satellite program in the early 1960s, it has employed two functionally different types of spacecraft, both built by Lockheed using the Agena:

- Search-and-find satellite, for large-area surveillance of the Soviet Union and Red China, to detect new construction facilities of strategic interest. Photos are taken by a camera with a moderate-resolution lens, built by Eastman Kodak Co., and the film is developed on board. Later, when the satellite comes within range of one of seven ground stations situated around the globe, the processed film is scanned by a laser-beam device, produced by CBS Laboratories, to convert the image to an electrical signal which is transmitted to the earth station.
- Close-look satellite, for more detailed examination of newly discovered objects of interest uncovered by the search-and-find type satellite, or already catalogued facilities. This type of satellite usually is outfitted with a high-resolution camera or multi-spectral cameras. After approximately two weeks in orbit, the exposed film, which has fed into the spacecraft's nose capsule, is returned to earth and recovered by Lockheed C-130 aircraft equipped with trapeze-like cables that loop over the capsule's parachute. This is a technique first developed in the USAF/Lockheed Discoverer series.

The current generation of search-and-find reconnaissance satellites is launched into a near-polar orbit using a USAF/McDonnell Douglas Long-Tank-Thrust-Augmented-Thor (LTTAT). Typically the satellite has an initial perigee of about 100 mi. and remains in orbit for three to four weeks.

The close-look type of reconnaissance satellite, slightly heavier than the other type, is launched by a USAF/Martin Marietta Titan 3B. The spacecraft perigee usually is only approximately 80 mi., to maximize ground resolution. The Agena engine, built by Bell Aerospace, is used periodically to boost altitude to provide an orbital lifetime of approximately two weeks.

The U.S. has been gradually reducing the number of reconnaissance satellites of both types which it orbits each year—an indication of the ability of both to carry more film than in the mid-1960s. Whereas the U.S. orbited a total of 13 of the search-and-find spacecraft in 1965, the number declined to only four last year. Similarly, the number of recoverable satellites had dropped to only five in 1970, although the total days in orbit were nearly as many as the U.S. obtained in 1968 by using eight satellites.

Normally, the two types of satellites are launched alternately, allowing sufficient time for photo analysis at the National Photographic Interpretation Center in Washington to study the pictures from the search-and-find spacecraft before selecting targets for the next close-look satellite mission.

The complementary operation of the two types of reconnaissance satellites is illustrated by the time of official and unofficial disclosures on the new types of Soviet missile silos discovered early this year:

- Nov. 18, 1970: U.S. radio transmission-type reconnaissance satellite launched, which remained in orbit until Dec. 11.
- Feb. 9, 1971: Film-pack returned from recoverable type satellite launched on Jan. 21.
- Mar. 4, 1971: Intelligence officials testifying before the Senate Armed Services Committee disclosed the discovery of the new type Soviet silos. At that time, the number of new silos discovered by satellite photos was about 10.
- Mar. 24, 1971: U.S. launches new radio-reconnaissance satellite to search for additional silos of the new type. Satellite remained in orbit until Apr. 12.
- Apr. 23, 1971: Defense Secretary Melvin Laird disclosed the U.S. had discovered approximately 40 of the new type Soviet missile silos.
- Apr. 27, 1971: Laird disclosed that USSR had resumed construction of its anti-ballistic missile (ABM) system near Moscow, after a three-year lull.
- May 13, 1971: Film pack capsule returned from recoverable close-look satellite launched Apr. 22.
- May 26, 1971: Defense Dept. officials disclosed that 60 of the new Soviet silos had now been discovered. They revealed that the new silos had first been discovered in December, 1970—which would be several weeks after the launch of the search-and-find satellite on Nov. 18. Further, that the diameter of the holes had originally been estimated at slightly less than 30 ft. But within recent weeks, the Pentagon officials disclosed, it had been discovered that there were two slightly different size silos, whose inner diameters differed by approximately 4 ft. Of the 60 new type silos, about one-third were at SS-9 missile bases and the remainder at SS-11 sites.
- Aug. 7, 1971: Pentagon officials disclosed that the Soviets now have nearly 80 of the new type silos.
- Aug. 12, 1971: U.S. launches new

Soviet Advance

The Soviet Union also has introduced an improved, longer-lived version of its recoverable reconnaissance satellite. Until the summer of 1968, all of the Russian recoverable satellites remained in orbit for eight days or less.

Cosmos 228, launched on June 21, 1968, was the first to stay aloft for 12 days. Gradually the Soviets began to launch more of the longer-duration spacecraft.

In 1970, nearly half of the 29 recoverable satellites launched by the USSR remained aloft for 12-13 days. During the first six months of 1971, all of the Soviet recoverable satellites remained in orbit for 12-14 days.

The longer-duration satellites enabled the USSR to begin to cut back on the total number of recoverable reconnaissance satellite launches, beginning in 1970. Judging from Soviet [illegible] the total will decline again this year by approximately 15%.